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Electro-Optic Effects in Colloidal Dispersion of Metal Nano-Rods with Nematic Ordering[1] OLEG D. LAVRENTOVICH, Liquid Crystal Institute, Kent State University, ANDRII B. GOLOVIN, JIE XIANG, HEUNG-SHIK PARK, LUANA TORTORA, YURIY A. NASTISHIN, SERGIJ V. SHIYANOVSKII, Liquid Crystal Institute, Kent State University — In modern transformation optics, one explores metamaterials with properties that vary from point to point in space and time, suitable for applications in devices such as an "optical cloak" [1] and an "optical black hole" [2]. We propose an approach to construct spatially varying and switchable metamaterials that are based on colloidal dispersions of gold (Au) nano-rods (NRs) in dielectric fluids [3], in which dielectrophoretic forces, originating in the electric field gradients, create spatially varying configurations of aligned NRs. We quantify the electric field induced orientational order and concentration distribution of Au NRs and the describe the ensuing optical effects. We demonstrate that the gradient electric-field induces a nematic birefringent phase in the toluene dispersions of AuNR and determine how the refractive indices change in space. [1] W. Cai, U.K. Chettiar, A.V. Kildishev, V.M. Shalaev, Nature Phot. **1**, 224 (2007); [2] E.E. Narimanov, A.V. Kildishev, Appl. Phys. Lett. **94**, 041106 (2009); [3] A.B. Golovin, O.D. Lavrentovich, Appl. Phys. Lett. **95**, 254104 (2009).

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